

JUN 18 1990

0-77149-1

1-24-1990

# FLOOD INSURANCE STUDY



## VILLAGE OF ALAMANCE, NORTH CAROLINA

ALAMANCE COUNTY



AUGUST 15, 1990



Federal Emergency Management Agency

COMMUNITY NUMBER - 370457

NOTICE TO  
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

## TABLE OF CONTENTS

|                                               | <u>Page</u> |
|-----------------------------------------------|-------------|
| 1.0 <u>INTRODUCTION</u>                       | 1           |
| 1.1 Purpose of Study                          | 1           |
| 1.2 Authority and Acknowledgments             | 1           |
| 1.3 Coordination                              | 2           |
| 2.0 <u>AREA STUDIED</u>                       | 2           |
| 2.1 Scope of Study                            | 2           |
| 2.2 Community Description                     | 2           |
| 2.3 Principal Flood Problems                  | 2           |
| 2.4 Flood Protection Measures                 | 4           |
| 3.0 <u>ENGINEERING METHODS</u>                | 4           |
| 3.1 Hydrologic Analyses                       | 4           |
| 3.2 Hydraulic Analyses                        | 5           |
| 4.0 <u>FLOODPLAIN MANAGEMENT APPLICATIONS</u> | 6           |
| 4.1 Floodplain Boundaries                     | 6           |
| 4.2 Floodways                                 | 6           |
| 5.0 <u>INSURANCE APPLICATION</u>              | 7           |
| 6.0 <u>FLOOD INSURANCE RATE MAP</u>           | 9           |
| 7.0 <u>OTHER STUDIES</u>                      | 9           |
| 8.0 <u>LOCATION OF DATA</u>                   | 9           |
| 9.0 <u>REFERENCES AND BIBLIOGRAPHY</u>        | 9           |

## TABLE OF CONTENTS (continued)

### Page

### FIGURES

|        |   |   |                    |   |
|--------|---|---|--------------------|---|
| Figure | 1 | - | Vicinity Map       | 3 |
| Figure | 2 | - | Floodway Schematic | 7 |

### TABLES

|       |   |   |                       |   |
|-------|---|---|-----------------------|---|
| Table | 1 | - | Summary of Discharges | 5 |
| Table | 2 | - | Floodway Data         | 8 |

### EXHIBITS

#### Flood Profiles

Big Alamance Creek

Panel 01P

#### Flood Insurance Rate Map

#### Elevation Reference Marks

## FLOOD INSURANCE STUDY

### VILLAGE OF ALAMANCE, ALAMANCE COUNTY, NORTH CAROLINA

#### 1.0 INTRODUCTION

##### 1.1 Purpose of Study

This Flood Insurance Study revises and supersedes a portion of a previous Flood Insurance Study for Alamance County, North Carolina (Reference 1) and provides the Village of Alamance, North Carolina with a separate Flood Insurance Study. The Village of Alamance is deemed to have been a participant in the regular phase of the National Flood Insurance Program as part of the county. This information will be used by the community to update existing floodplain regulations as part of the regular phase of the National Flood Insurance Program. The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by the Federal Emergency Management Agency (FEMA) for purposes of the National Flood Insurance Program.

The data were identified as applicable at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the National Flood Insurance Program. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the Natural and Technological Hazards Division, FEMA, Atlanta, Georgia, for consideration for revision of this study.

##### 1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were obtained from the Flood Insurance Study for Alamance County, North Carolina (Reference 1).

### 1.3 Coordination

The North Carolina Department of Natural Resources and Community Development (state coordination agency), county officials, and local residents were notified of the initiation of the study and requested to furnish flood hazard data. Information was also requested from the U.S. Soil Conservation, and the U.S. Geological Survey (USGS).

An initial coordination meeting was held between the U.S. Army Corps of Engineers (COE), FEMA, county officials, and local residents on December 13, 1977 to inform the county of the nature and purpose of the Flood Insurance Study, to solicit local input, and to identify streams requiring detailed study. An additional coordination meeting was held by COE on August 11, 1978.

On August 28, 1989, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the community and FEMA.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Alamance, Alamance County, North Carolina. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected based on the extent and validity of available existing hydrologic and hydraulic data.

Flooding caused by overflow of Big Alamance Creek was studied in detail.

### 2.2 Community Description

The Village of Alamance is in central Alamance County in north-central North Carolina. Alamance is bounded on the east, south, and west by the Unincorporated Areas of Alamance County and on the north by the City of Burlington. The community is served by State Road 62. The 1980 population of the Village of Alamance was reported to be 320 (Reference 2).

Alamance has a mild climate with an average annual temperature of 60 degrees Fahrenheit and an average annual rainfall of 45 inches (Reference 3).

### 2.3 Principal Flood Problems

Low-lying areas of Alamance County flood periodically from the Haw River, Big Alamance Creek, Haw Creek, Gunn Creek, Reedy Fork and other streams included in this study. Flooding on the larger streams results primarily from tropical storms and major weather fronts, while flooding on the smaller streams is due mainly to local thunderstorms.

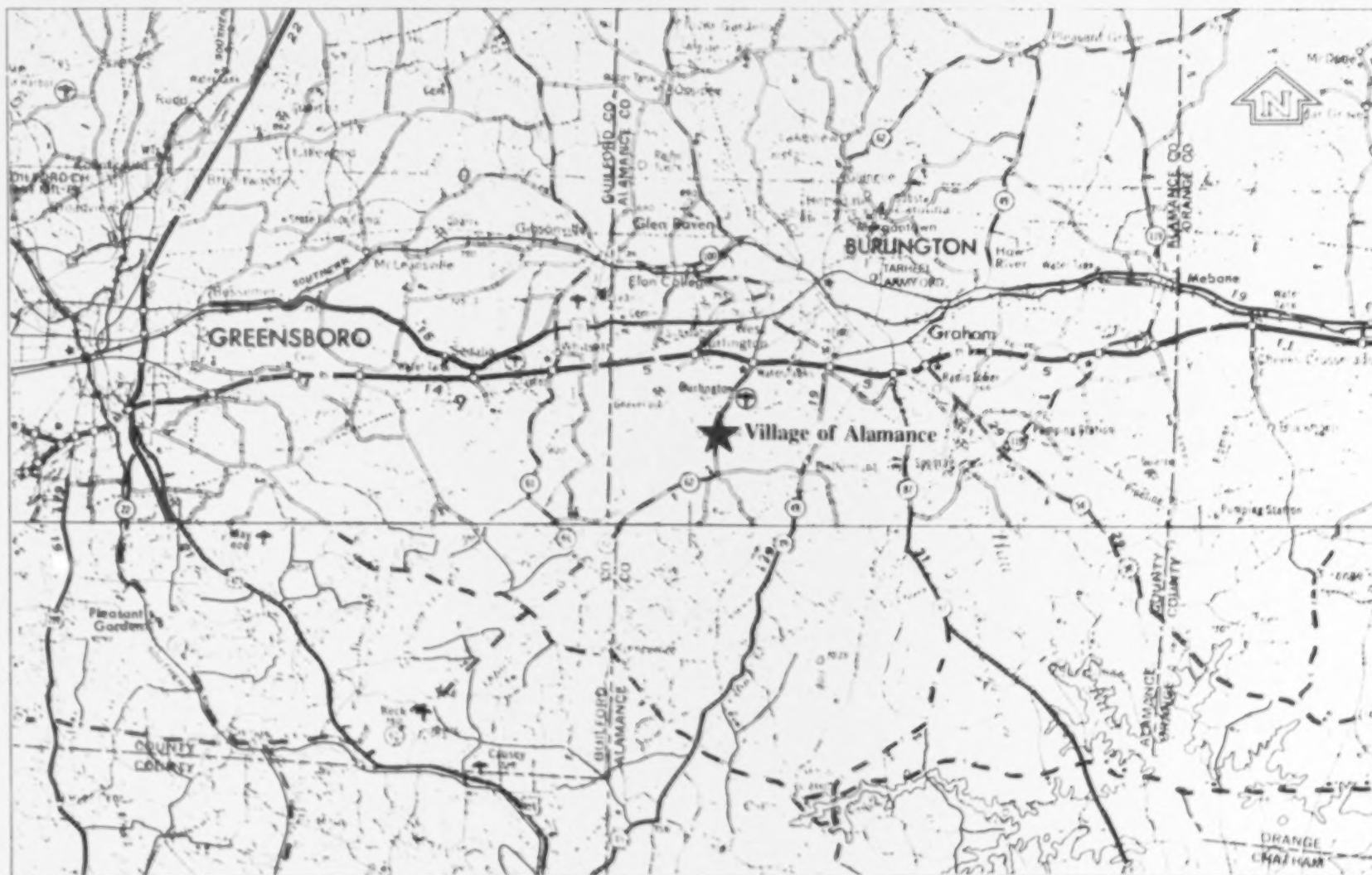


**FIGURE 1**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**VILLAGE OF ALAMANCE, NC**  
(ALAMANCE CO.)

APPROXIMATE SCALE



**VICINITY MAP**

The USGS has operated six stream gages in the vicinity of Alamance County. Data from these gages are presented in Table 1, Summary of Discharges. Floods in the county occurred in 1908, 1945, 1947, 1954, 1967, and 1972. The September 1945 flood is the maximum flood of record on the Haw River and approximates the 70-year flood. The October 1954 flood on Gunn Creek approximated a 20-year flood, while the September 1947 flood on Reedy Fork exceeded the 100-year flood. The most recent flood occurred in June 1972 and approximated the 20-year flood on the upper Haw River and the 50-year flood on Reedy Fork.

#### 2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area. A small dam located upstream of State Road 62 does not provide protection to the community.

### 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

#### 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Peak discharge-frequency relationships for tributary streams were based on a log-Pearson Type III Method (Reference 4) regional study of 52 gages with lengths of record ranging from 10 to 50 years (Reference 5). These gages monitor drainage areas of less than 200 square miles in Piedmont, North Carolina. For urban streams, the discharges were adjusted to account for existing urbanization in the watershed using USGS procedures (Reference 6).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

| <u>FLOODING SOURCE<br/>AND LOCATION</u>                       | <u>DRAINAGE AREA<br/>(SQ MILES)</u> | <u>PEAK DISCHARGE (CFS)</u> |                |                 |                 |
|---------------------------------------------------------------|-------------------------------------|-----------------------------|----------------|-----------------|-----------------|
|                                                               |                                     | <u>10-YEAR</u>              | <u>50-YEAR</u> | <u>100-YEAR</u> | <u>500-YEAR</u> |
| BIG ALAMANCE CREEK                                            |                                     |                             |                |                 |                 |
| at mouth                                                      | 260.8                               | 14,316                      | 24,910         | 30,803          | 48,393          |
| just upstream of<br>confluence of<br>Little Alamance<br>Creek | 242.7                               | 13,650                      | 23,790         | 29,215          | 46,275          |

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross-section data, elevation data, and structural geometry of bridges and culverts were obtained from field surveys.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Water-surface elevations were developed using the HEC-2 computer step-backwater model (Reference 7). Starting water-surface elevations were determined by the slope-area method.

Roughness coefficients (Manning's "n") were determined from field inspection. The roughness coefficient for Big Alamance Creek channel was 0.055 and the range for the overbanks was 0.08 to 0.11.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

#### 4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

##### 4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using Alamance County topographic maps at a scale of 1:4800 with a contour interval of 5 feet (Reference 8).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE) and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

##### 4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways for this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for Great Alamance Creek lie outside the corporate limits.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point within the community. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

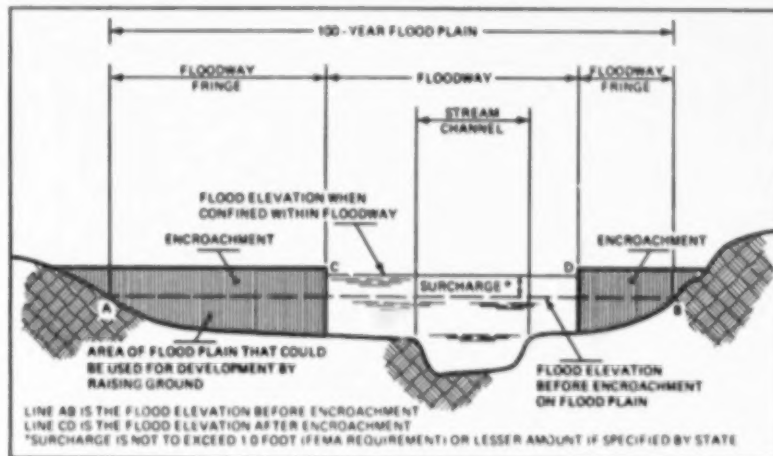


FIGURE 2 - Floodway Schematic

## 5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

### Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

| FLOODING SOURCE       |                       | FLOODWAY                     |                               |                                 | BASE FLOOD WATER SURFACE ELEVATION |                                    |                                 |                    |
|-----------------------|-----------------------|------------------------------|-------------------------------|---------------------------------|------------------------------------|------------------------------------|---------------------------------|--------------------|
| CROSS SECTION         | DISTANCE <sup>1</sup> | WIDTH <sup>2</sup><br>(FEET) | SECTION<br>AREA<br>(SQ. FEET) | MEAN<br>VELOCITY<br>(FEET/SEC.) | REGULATORY<br>(FEET NGVD)          | WITHOUT<br>FLOODWAY<br>(FEET NGVD) | WITH<br>FLOODWAY<br>(FEET NGVD) | INCREASE<br>(FEET) |
| BIG ALAMANCE<br>CREEK |                       |                              |                               |                                 |                                    |                                    |                                 |                    |
| A                     | 46,640                | 300                          | 5352                          | 4.0                             | 509.1                              | 509.1                              | 509.7                           | 0.6                |
| B                     | 47,900                | 225                          | 4701                          | 4.5                             | 509.9                              | 509.9                              | 510.6                           | 0.7                |
| C                     | 48,420                | 230                          | 4047                          | 5.2                             | 510.5                              | 510.5                              | 511.2                           | 0.7                |
| D                     | 49,290                | 320                          | 6412                          | 3.3                             | 511.4                              | 511.4                              | 512.0                           | 0.6                |
| E                     | 49,536                | 330                          | 5362                          | 3.9                             | 511.5                              | 511.5                              | 512.1                           | 0.6                |
| F                     | 50,390                | 290                          | 4722                          | 4.5                             | 512.2                              | 512.2                              | 512.8                           | 0.6                |

<sup>1</sup>FEET ABOVE MOUTH

<sup>2</sup>THIS EXTENDS BEYOND CORPORATE LIMIT

|         |                                           |                    |
|---------|-------------------------------------------|--------------------|
| TABLE 2 | FEDERAL EMERGENCY MANAGEMENT AGENCY       | FLOODWAY DATA      |
|         | VILLAGE OF ALAMANCE, NC<br>(ALAMANCE CO.) | BIG ALAMANCE CREEK |

## Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

### 6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

### 7.0 OTHER STUDIES

The Flood Insurance Studies published for Alamance County and for the City of Burlington, North Carolina (References 1 and 9) are in agreement with this study.

### 8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE, Suite 736, Atlanta, Georgia 30309.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To assure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

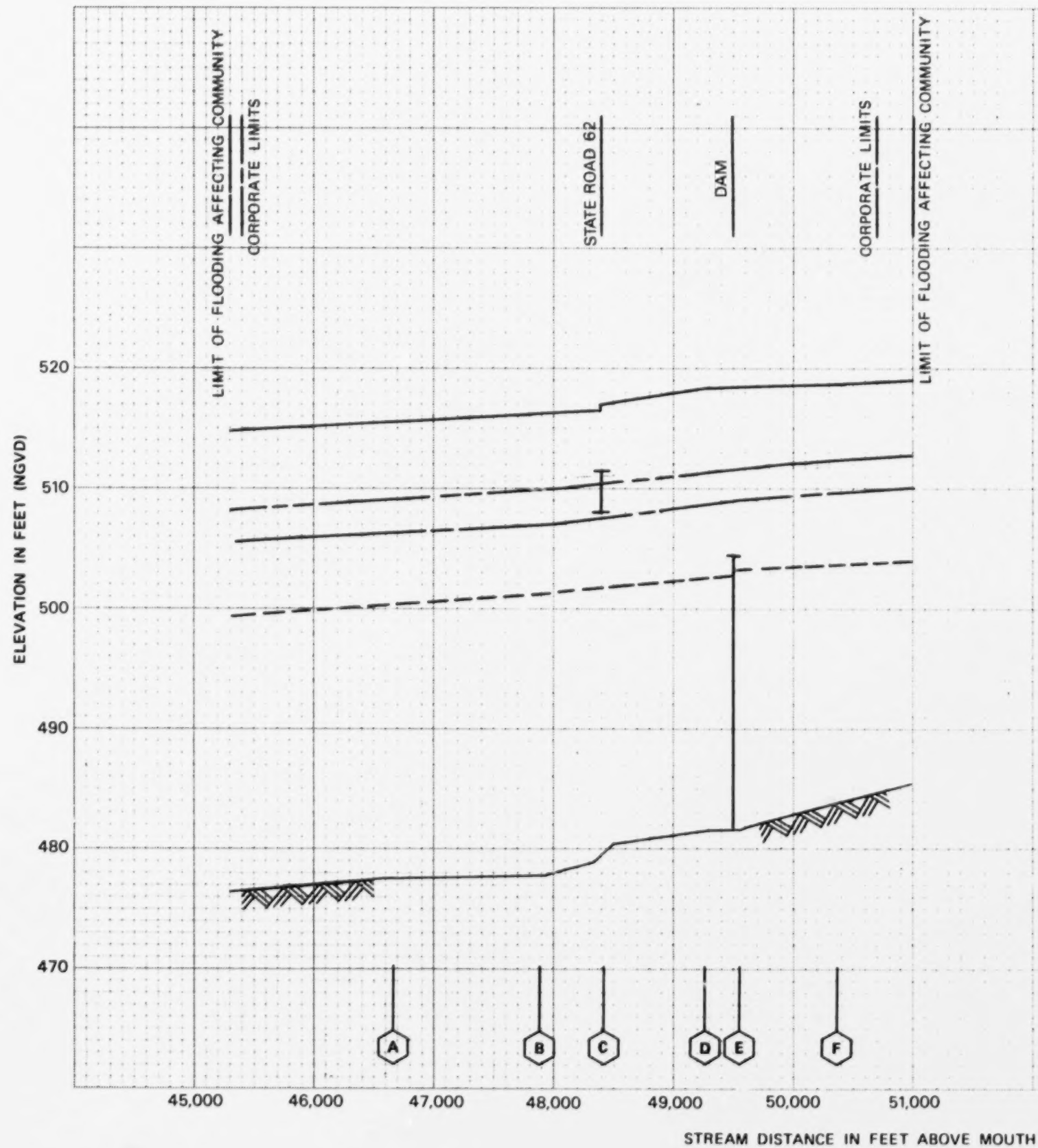
### 9.0 REFERENCES AND BIBLIOGRAPHY

1. Federal Emergency Management Agency, Flood Insurance Study, Alamance County, Unincorporated Areas, North Carolina, April 1987.
2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, North Carolina, Washington, D.C., February 1982.
3. ———, National Oceanic and Atmospheric Administration, Environmental Data Services, Climatological Data for North Carolina, Asheville, North Carolina, 1977.

4. U.S. Water Resources Council, Bulletin No. 17, Guidelines for Determining Flood Flow Frequency, March 1976.
5. U.S. Department of the Interior, Geological Survey, Surface Water Records, Water Resources Data for North Carolina and Virginia, Part 1, Summary 1965, subsequent annual reports.
6. ———, Geological Survey, Effect of Urban Development on Floods in the Piedmont Province North Carolina, Arthur L. Putnam, 1972.
7. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Computer Program 723-X6-L202A, Davis, California, December 1968.
8. Alamance County, North Carolina, Department of Planning, Topographic Map, Alamance County, North Carolina, Scale 1:4800, Contour Interval: 5 Feet, April 1969.
9. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Burlington, Alamance County, North Carolina, April 1981.

# ELEVATION REFERENCE MARKS

| <u>REFERENCE<br/>MARK</u> | <u>FLOOD INSURANCE<br/>RATE MAP<br/>PANEL</u> | <u>ELEVATION<br/>(FEET NGVD)</u> | <u>DESCRIPTION<br/>OF LOCATION</u>                                                                                             |
|---------------------------|-----------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1                         | 0001                                          | 541.20                           | U.S. Coast & Geodetic Survey disk<br>located about 250 feet southeast of<br>intersection of Cardinal Lane and<br>State Road 62 |



**FLOOD PROFILES**

**BIG ALAMANCE CREEK**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**VILLAGE OF ALAMANCE, NC**  
(ALAMANCE CO.)

12